

REMARKS

Reexamination and reconsideration of this application is respectfully requested. Claims 1-24 remain in the application.

Applicants believe there is no charge for this amendment as no new claims have been cancelled, amended, or added.

Objection to the Specification

The Final Office Action objected to the disclosure due to an inadvertent grammatical error. However, Applicants would like to kindly point out that the portion of the disclosure objected to by the Final Office Action has been amended in Applicants' previous response, mailed May 28, 1999.

Accordingly, Applicants respectfully request that the objection to the disclosure be withdrawn.

Response to the 35 U.S.C. §103(a) Rejection

The Final Office Action rejects claims 1, 9, and 17 under 35 U.S.C. §103(a) as being unpatentable over Kuribayashi (JP 2-76481 (A)) and Pain et al. (U.S. 5,886,659). Applicants respectfully traverse this rejection in view of the remarks that follow.

For the Examiner's convenience, claim 1 is presented below:

1. At lest one integrated circuit comprising:
image processing circuitry;
said image processing circuitry being adapted to process digital pixel output signals produced by a digital imaging array;
said image processing circuitry being adapted to process saturated digital pixel output signals differently from non-saturated digital pixel output signals.

Applicants believe that the final rejection is based on a misunderstanding of the teachings of Kuribayashi. More importantly, the Final Office Action does not appreciate the differences between the devices disclosed by Kuribayashi and that fall within the scope of Applicants' claimed invention. Accordingly, Applicants would like to begin by highlighting some of these differences.

Applicants would like to point out that claim 1 specifically recites that saturated digital pixel output signals are processed differently from non-saturated digital output signals (emphasis added).

Although Applicants' invention is not limited to this embodiment, an example of processing saturated and non-saturated output signals is shown in Applicants' FIG. 1 and described in Applicants' specification on pages 5, line 30, through page 6, line 15. In addition, Applicants provided a definition of saturated on page 4, lines 17-24, which states:

"For example, when employing binary digital signals of a fixed length, the dynamic range for the intensity of light received by a pixel of the imaging array is inherently limited. Therefore, when a pixel is exposed to an intensity of light that exceeds that dynamic range, the image quality is affected because the digital pixel output signal becomes saturated or clipped and, therefore, the output signal of the pixel is not an accurate representation of the intensity of the light to which the pixel was exposed." (emphasis supplied)

When the output signal associated with a pixel is saturated, the signal does not provide an accurate representation of the intensity of light. This is because the output signal does not have the range desired to represent both normal images and images that come from a very bright source, such as the sun, for example. "As a result, the dynamic range of the intensity for all the image features is usually well beyond the capability of a digital sensor, leading to signal clipping." (see page 4, lines 24-26).

Summary of Kokai application

According to the Final Office Action, Kuribayashi teaches that the transmission light control part (element 15) processes saturated (bright) pixel output signals differently from non-saturated signals by adjusting the optically shielded elements according to the intensity of the light.

However, Applicants respectfully submit that the Final Office Action has incorrectly characterized the teachings of the Kokai application. More significantly, the Final Office Action has applied the language recited in Applicants' claim 1 in a manner that is inconsistent with the explicit teachings of the Kokai application.

Applicants' use of "saturated" is not synonymous with Kuribayashi's use of "bright"

Kuribayashi teaches that the overall quality of an optical image may be unacceptable if either back light or high intensity light is used as the reference for an image. When high or low intensity light is used as the reference to calibrate an image, the intensity of a normal image will be either too dark or too bright. In particular, the Kokai application states:

"For example, when the portion with high luminosity is taken as the reference, the amount of light is not sufficient in the portion with low luminosity, so the entire image becomes dark. On the other hand, when the portion with low luminosity is taken as the reference, the amounts [sic] of light is excessive in the portion with high luminosity so the peripheral portion becomes blurred, and the image pickup plane may be damaged." (page 4, lines 7-14, of the translation).

Kuribayashi discloses a device that solves "... the problems of the aforementioned conventional scheme by providing a type of image pickup device which is able to form a normal video signal reliably even when light of abnormally high intensity is included." To do this, shutters (e.g., window shaped elements 14a) are adjusted in locations receiving light of abnormally high intensity so that a normal video signal can be obtained. (page 5, lines 6-8). As repeatedly stated in the description, Kuribayashi teaches the use of shutters to block out light of abnormally high intensity (i.e., bright light) so that a better image is captured.

However, Kuribayashi does not contain any teaching or suggestion of the problem discussed in Applicants' specification. In particular, Kuribayashi is devoid of any discussion related to the clipping that can occur when binary digital signals are used to represent the intensity of a pixel. As discussed above with reference to Applicants' specification, when a binary digital signal does not have sufficient dynamic range to represent a pixel, an inaccurate value results. When this occurs, the digital pixel output is considered saturated because the intensity exceeds the ability of the circuit to represent the intensity value.

Kuribayashi does not contain any teaching or suggestion of binary digital values. Moreover, Kuribayashi does not contain any teaching or suggestion of clipping or how to process saturated digital pixel output signals. Rather, the Final Office Action conceded that Kuribayashi does not involve a digital image array.

Thus, by the Examiner's own admission, Kuribayashi does not suffer from the problem of limited dynamic range or saturation.

In addition, whether a digital pixel output signal is saturated, does not depend on how bright one pixel is relative to another. Instead, a digital pixel output signal may become saturated if the intensity of a particular pixel exceeds the dynamic range of the binary value used to represent the intensity. This determination is independent of the brightness of one pixel as compared to another. Simply stated, Kuribayashi uses "bright" or "abnormally high intensity" to indicate that the intensity of some pixels is significantly greater than the intensity of normal pixels. In contrast, Applicants' use of "saturated" refers to the inability of image processing circuitry to accurately represent the intensity of an individual pixel because the intensity of that particular pixel exceeds the dynamic range. Therefore, the Final Office Action has incorrectly asserted that the use of "bright" or "abnormally high intensity" light is synonymous with "saturated."

Accordingly, Applicants respectfully submit that the use of "bright" or "abnormally high intensity" as used by Kuribayashi refers to the intensity of some pixels as compared to the intensity of "normal" pixels. In contrast, Applicants' use of "saturated" relates to the dynamic range of an optical system and the ability of the image processing circuitry to represent a digital pixel output signal with a binary digital value having a fixed number of bits. Consequently, the assertion in the Final Office Action that "bright" is synonymous with "saturated" is not only incorrect and unsubstantiated, it is contrary to the definition of the terms as used by Kuribayashi and as used in Applicants' specification.

Traversal of Rejection under 35 U.S.C. § 103

Applicants respectfully traverse this rejection in view of the reasons stated below. Additional arguments to distinguish the cited patent from claims 1, 9, and 17 could have been made, but it is believed that the foregoing discussion is sufficient to overcome the Examiner's rejection.

THE INDEPENDENT CLAIMS INCLUDE LIMITATIONS THAT ARE NOT TAUGHT OR SUGGESTED BY THE COMBINATION OF KURIBAYASHI AND PAIN ET AL.

It is well established that obviousness requires a teaching or a suggestion by the relied upon prior art of all the elements of a claim (M.P.E.P. §2142). Without

conceding the appropriateness of the combination, Applicants respectfully submit that the combination of Kuribayashi and Pain et al. does not meet the requirements of an obvious rejection in that neither teaches or suggests that saturated digital pixel output signals are processed differently from non-saturated digital pixel output signals.

As discussed above, Kuribayashi discloses a device that uses shutters to adjust the brightness of individual pixels. However, the Final Office Action concedes that Kuribayashi does not involve a digital image array. Consequently, Kuribayashi does not contain any teaching or suggestion of the problems associated with digital image arrays, namely clipping. Furthermore, Kuribayashi does not contain any teaching or suggestion of how the device could be modified to address the problem of clipping. Since Kuribayashi does not contain any teaching or suggestion of clipping, it cannot contain any teaching or suggestion of the difference between saturated versus non-saturated digital pixel outputs. Therefore, Kuribayashi cannot contain any teaching or suggestion of how to process saturated digital pixel outputs differently from non-saturated digital pixel output signals.

In addition, Applicants respectfully submit that Pain et al. is also devoid of any teaching or suggestion of processing saturated digital pixel output signals differently from non-saturated digital pixel output signals. Since Kuribayashi and Pain et al., taken separately, are devoid of any teaching or suggestion of the limitations recited in claims 1, 9, and 17, the combination of Kuribayashi and Pain et al. must necessarily be devoid of the required teaching or suggestion of all the elements recited in claims 1, 9, or 17. Consequently, the combination cannot make Applicants' claims 1, 9, or 17 obvious.

Applicants would like to emphasize that the preceding paragraphs were not intended to attack Kuribayashi and Pain et al. separately. But instead, Applicants have shown each is devoid of claimed elements so that, by default, the combination is also devoid of at least some of the features of Applicants' claimed invention.

Claims 2-8, 10-16, and 18-24 are rejected under 35 U.S.C. 103(a) as being unpatentable in view of the Kokai application by Kuribayashi and Takase. This rejection is respectfully traversed.

Applicants do not concede that the Final Office Action has properly combined these documents, in fact, Applicants believe the combination to be improper. However, assuming, simply for the sake of argument, that such as

combination were proper, nonetheless, the combination would fail to produce the invention as claimed.

As indicated above, the Kokai application does not teach processing saturated signals differently than non-saturated signals. The rejected claims depend from and include all of the limitations of one of claims 1, 9, and 17. Therefore, even if the combination were proper, the combination would still fail to produce the invention as claimed. As indicated above, one of ordinary skill in the art having the Kokai application, and now also the Takase patent, before him or her would not be able to produce the invention, even assuming the combination were proper, although it is again asserted that the combination is not. Therefore, it is respectfully submitted that the combination of the Kokai application and Takase cannot make Applicants' claims 2-8, 10-16, and 18-24 obvious.

Conclusion


The foregoing is submitted as a full and complete response to the Final Office Action mailed August 18, 1999, and it is submitted that claims 1-24 are in condition for allowance. Reconsideration of the rejection is requested. Allowance of claims 1-24 is earnestly solicited.

Should it be determined that an additional fee is due under 37 CFR §§1.16 or 1.17, or any excess fee has been received, please charge that fee or credit the amount of overcharge to deposit account #02-2666.

If the Examiner believes that there are any informalities which can be corrected by an Examiner's amendment, a telephone call to the undersigned at (480) 554-9732 is respectfully solicited.

Respectfully submitted,

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